DOCUMENT RESUME

ED 229 284 SO 014 455

AUTHOR Shaver, James P.; Oliver, Donald W.
TITLE The Effect of Student Characteristic-Teaching Method Interactions on Learning to Think Critically.
SPONS AGENCY Office of Education (DHEW), Washington, D.C.
PUB DATE 9 Feb 68
NOTE 33p.; Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, IL, February 9, 1968).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Controversial Issues (Course Content); *Critical Thinking; Educational Research; Junior High Schools; *Personality Traits; *Social Studies; *Student Characteristics; *Teaching Methods
IDENTIFIERS Socratic Method

ABSTRACT

The relationship among teaching methods, student personality traits, and learning outcomes was investigated in this study involving 125 7th and 8th grade students who were being taught to think critically about public controversy. While background material was presented to all students uniformly, students were assigned to two different types of discussion groups, socratic and recitation, for the discussion of short cases presenting public policy decisions. In the socratic discussions students were forced to take positions and defend them. The recitation discussions emphasized the nonpersonal discussion of various dimensions of the issue posed by the case. Personality measures were administered to the students. Interactions were measured using a variety of tests. Findings do not indicate stability of interaction patterns in the sense that certain personality variables consistently interacted with the two discussion styles investigated. There is a strong suggestion that the appropriateness of the teaching method depends not only on the student's personality traits, but on the learning outcome to be measured. (RM)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

ED029284

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

James P. Shaver

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

# The Effect of Student Characteristic-Teaching Method Interactions on Learning to Think Critically*

James P. Shaver
Utah State University

and

Donald W. Oliver
Harvard University

SP 014 455

Paper presented to the Annual Meeting of the American Educational Research Association, Chicago, February 9, 1968. The research reported in this paper was carried out in part with support from the United States Department of Health, Education, and Welfare, Office of Education.

# The Effect of Student Characteristic-Teaching Method Interactions on Learning to Think Critically*

James P. Shaver
Utah State University

and

Donald W. Oliver
Harvard University

Research in the effectiveness of teaching methods has not had a particularly fruitful history. Studies of methods of teaching students to think critically have been no exception. Undoubtedly the general lack of knowledge about the differential effectiveness of different teaching methods is due in some measure to factors such as the use of inadequate criterion measures (McKeachie, 1962, pp. 66-67) and the failure to confirm that anticipated differences in teaching methods did occur (Wispe, 1953). To a large degree, however, the inconclusive and inconsistent findings must be seen as the outcome of research strategies that have failed to take into account that averaging scores and comparing means may obscure the differing effects that any one method has on subgroups of students (McKeachie, 1961).

Some aspects of a project aimed at teaching junior high school students to think critically about public controversy have been reported previously (Oliver & Shaver, 1962, 1966). However, the project's investigation of the varying appropriateness of different teaching methods for subgroups of students was not presented extensively in the published report.

## Design

The project was given the responsibility for the social studies program of approximately 125 students as they moved through the seventh and eighth

---

*Paper presented to the annual meeting of the American Educational Research Association, Chicago, February 9, 1968. The research reported in this paper was carried out in part with support from the United States Department of Health, Education, and Welfare, Office of Education.

grades of a suburban Boston school. While the general emphasis of the project's curricular efforts was on teaching the students to think critically, the specific concern was with teaching the students concepts that would help them to analyze public controversy more adequately. The analytic concepts were directed at three types of problems to be confronted in dealing with public issues: (1) clarifying language, (2) determining matters of fact, and (3) making value choices.

The concepts were first taught as an instructional unit, using civil rights cases (e.g., on free speech) to illustrate their application. Then the students were exposed to a number of substantive units centered on public issues (e.g., a six-week unit on school desegregation) to which the analytic concepts could be applied. While background material was presented to all students uniformly, using common media such as written material and movies, students were assigned to two different types of discussions, socratic and recitation, for the discussion of short (two and three page) cases presenting public policy decisions.

In the socratic discussions, the teacher encouraged individual students to take personal positions on policies to handle the issue presented in the case and then defend the stand. In particular, the teacher was to force the student to face and deal with inconsistencies between his values and between his factual beliefs and his values in arriving at a defensible position. Recitation discussions were based on the same cases as the socratic discussions, but involved questions programed and dispersed among group members so as to get the class as a whole to explore the various factors that should be taken into account in making a decision. Rather than forcing students to take positions and defend them, the emphasis was on the nonpersonal discussion of the various dimensions of the issue posed by the case.

A set of observational categories were developed to determine whether or not the experimental teachers' behaviors were in line with the prescribed discussion styles (teaching methods). The style differences were confirmed (Shaver, 1964; Oliver & Shaver, 1966, pp. 290-299).

Analysis

Having established the differences in teaching behavior for the two methods, the analysis of student learning was in order. First, the experimental students were compared with students in two control schools in similar communities using covariance to adjust for intelligence test and pretest score differences. On tests of social studies knowledge (The Iowa Test of Educational Development No. 1 and The Principles of American Citizenship Test) and of general reasoning (The Iowa Test of Educational Development No. 5 and parts of the Watson-Glaser Critical Thinking Appraisal and the Michigan State Test of Problem Solving), there were no significant differences. On tests developed by project staff to assess the use of concepts to be taught by the project, the experimental students scored significantly higher than the control students (Oliver & Shaver, 1966, pp. 262-273).

Next, the means of the students involved in the discussion of societal issues through the two different types of discussion, socratic and recitation, were compared. Analysis of covariance was used, controlling for differences in intelligence test scores and pretest scores. There were no significant differences between the students taught by the two discussion styles (Oliver & Shaver, 1966, pp. 299-302).

In the traditional methods research, this would have been the terminal finding. However, a number of personality measures had been administered to the experimental students in order to investigate relations between student

characteristics and learning. First, a correlational analysis was carried out. This analysis, reported in Oliver and Shaver (1966, pp. 316-320), indicated no personality measures which showed consistently high correlations with the measures of learning.

Next, distributions of scores on the personality measures were cut into thirds and students categorized by discussion style and their place in the distribution. Two-way analyses of covariance (adjusting for intelligence test and pretest scores) were carried out for seven learning outcome measures, using as classification variables thirteen personality measures.*

Interaction Findings

Of the ninety-one analyses, twelve interaction terms were significant at the .05 level. At this level of significance, only about five significant findings would have been expected to emerge by chance. Table 1 presents a summary of the personality and learning measures involved in the significant interactions.

The SIAT No. 4. The Social Issues Analysis Test No. 4 (SIAT No. 4) was a basic learning measure for the project because of its situational validity. The SIAT No. 4 is based on an interview patterned after the socratic teaching method defined earlier. The student is read a case involving a societal issue, encouraged to take a position on the issue, and challenged to consider the inconsistencies in his stand. The interview is recorded and the student's responses later

*To maintain proportionality among cell n's as required by the statistical model for the program used in the analyses, students were randomly withdrawn from cells as necessary. This process had some effect on results, and accounts for the significant style effects seen in Tables 1, 2, 5 and 13.

scored using a set of categories (Oliver & Shaver, 1966, pp. 212-225). Interscorer reliability was estimated by correlating the frequencies scored in individual categories by two scorers and by correlating the frequency of total valued acts for four scorers. The first set of coefficients ranged from .42 to .89 with the majority above .70; the second set of coefficents ranged from .55 to .93, with the next to the lowest coefficient..68.

The SIAT No. 4 was involved in four significant interactions, presented in Tables 2 through 5. The main effect of style was not significant for the SIAT No. 4, yet it is apparent that the socratic style was more effective for students low on authoritarianism (F-Scale)*, low in tendency to dichotomize (Word Description Test), low or high in need for structure (Berlak School Work Habits Test), and medium or high on the Guilford-Zimmerman Factor F (friendliness, including the ability to tolerate hostile action). At the same time, students medium or high on authoritarianism and tendency to dichotomize, low on the friendliness factor, and medium in need for structure are better prepared to perform in the socratic interview by recitation teaching.

These findings make sense** in light of the adversarial nature of the socratic style as compared to the low affect, orderly nature of recitation teaching. The person low on authoritarianism would be expected to function better in the give-and-take of a socratic discussion and thus learn more to be applied later in such discussions. The person high on authoritarianism might find the socratic teacher's aggressiveness so threatening as to inter-

---

*See the Appendix for brief descriptions of the personality variables and Table 14 for reliability estimates.

**Of course, interpreting findings such as these is always a tenuous process, if for no other reason than that any one result out of a number of analyses may be a chance finding.

fere with learning, or he might reject the teacher as an authority figure because of his unorthodox behavior. Even if he is able to handle the threat and accept the teacher's authority as well, the authoritarian may find the learning situation difficult when the authority figure does not give him clear cues as to proper behavior, as is the case in the ambiguity of the socratic discussion.

By the same token, the person who tends to dichotomize is likely to find socratic discussions uncomfortable. Either-or answers are clearly not acceptable to the teacher, and the resulting frustration might interfere with the learning of concepts to be applied in later discussions. The recitation teacher does not pose the same frustrating situation. More clearcut, definite answers are given to be remembered for later use.

The person with low tolerance for hostility (Guilford-Zimmerman Factor F) is not likely to function well in a socratic setting. Belligerence and resistance to the teacher are likely to be accompanied by tensions that interfere with learning. Moreover, having developed a set toward socratic discussions, the socratic interview is not likely to call forth optimal cognitive performance from the student with low tolerance for hostility. However, the low friendly student from a recitation discussion is thrust into a new situation in the interview. He has not experienced negative reactions to socratic probing; and, in fact, without the interference of built-up hostile reactions to socratic discussions, he appears to be able to call upon his learning to resist the socratic interviewer.

Need for structure presents a particularly interesting interaction because for individuals either low or high on this trait, socratic teaching is the best preparation for the socratic interview. This finding, too, makes

sense. The person low on need for structure is likely to find socratic discussions stimulating due to their openness; the person high in need for structure is likely to find in that same openness the motivation to build or impose structure. This is actually part of the rationale for socratic teaching--that it will force students to build conceptual structures for dealing with public issues. Apparently students with high need for structure do this. This is in line with another finding in the same project that need for structure generally tends to make a positive contribution to academic performance. (Oliver & Shaver, 1966, p. 319). It is not surprising that those in the middle of the need for structure range--i.e., perhaps lacking compulsion to provide their own order, but feeling sufficient need for structure to be bothered by the apparent lack of order in socratic discussions--would better learn the concepts and be better able to apply them in discourse when taught by recitation discussion.

In short, it seems clear that neither adversarial discussions or non-personal analysis is the best way to prepare all students to apply analytic concepts in controversial discussions outside the classroom.

The Headlines G Test. Another dependent variable involved in more than one significant interaction was the Headlines G Test, a measure of interest in public issues not studied as part of the project. Students were asked to rank in order of interest headlines, three to a set, describing public issues. The split-half reliability coefficient for this test for 103 students was .55, corrected with the Spearman-Brown Prophecy Formula. The low reliability coefficient may help to account for the rather nonstartling, although statistically significant, interactions found with the Headlines G Test.

The findings with the Headlines G Test are presented in Tables 6, 7, and 8. In Table 6, a slight but positive relationship between scores on the Need-Cognition Test (choosing cognitive as opposed to noncognitive activities) and scores on the Headlines G Test ($P<.01$) is noticeable. The significant interaction affect reflects the greater effectiveness of the recitation style with students medium in need for cognition. The findings in Table 7 indicate that recitation teaching is more effective in increasing interest with students low and high on the Guilford-Zimmerman Factor A (Ascendance), with a slight reversal for students in the middle category. This pattern is essentially repeated, although somewhat more strikingly, with the Submissiveness Test (conforming to external authority), as indicated in Table 8. Interestingly, scores on Factor A and the Submissiveness Test are basically independent for this sample with a correlation coefficient of -.16.*

The findings suggest that despite the generally more positive effect of recitation teaching on interest in societal issues, recitation discussions are particularly effective with students medium in their need for cognition, and low or high on ascendance and submissiveness. The last two findings in particular make sense. The high ascendant student is likely to find the adversarial challenge of the socratic teacher threatening, while the low ascendant student is likely to find it overwhelming. It would not be surprising if both emotions generalized to the topics under discussion. The person who is low in his tendency to submit to external authority (items on the Submissiveness Test refer largely to the norms laid down by external authority rather than to the physical demands of external authorities) is

---

*See Table 15 for the intercorrelations among the personality variables involved in significant interactions.

likely to find that socratic teachers do not structure their demands sufficiently to hold his interest (that is, lacking both internal compulsion and direct external pressure from the teacher, he is likely to disengage from the discussion during the teacher's lengthy interchanges with other individuals). By the same token, the student high in need to submit to authority can find, without threat, the cues from the recitation teacher which indicate that it is good (in the authority's eyes) to be interested in social issues.

The SIAT No. 2. One other test of learning was involved in multiple interactions, the Social Issues Analysis Test No. 2 (SIAT No. 2). For the SIAT No. 2, the student reads a dialogue involving an argument between two people and then answers a series of multiple choice items aimed primarily at (1) his understanding of the argument and (2) his ability to select rebuttal statements which would move the discussion along. The test-retest coefficient for administrations several months apart was .60.

The findings for the SIAT No. 2 are reported in Tables 9 and 10. They indicate that performance on the SIAT No. 2 is generally positively related to scores on the Need-Cognition Test, with the relationship much more marked for socratic than for recitation students. While performance on the SIAT No. 2 is better for low and medium need-cognition students who were in recitation discussions, it is better for high need-cognition students who were in socratic discussions. At the same time recitation discussions have a much greater positive effect on SIAT No. 2 scores for students who are high on the Guilford-Zimmerman Factor O (Objectivity). Apparently, individuals with high desire to be involved in cognitive activities are challenged by the socratic discussion to develop a structure of meaning that can later be applied

to other discussions (need-cognition scores correlated .52 with need-structure scores). For the person with low need for cognition, the recitation's more structured approach was more effective. At the same time, the person with a high objectivity score may be too "thick-skinned" and unsensitive to react to the socratic discussion. He may so lack sensitivity or be so defensive about his self-image that he withdraws from the socratic situation. He may, in fact, reject a situation in which it is suggested he is not competent, relating himself better to the cognitive task of building a structure for analyzing discussions in the recitation discussions where less "ridiculous" demands on his intellectual credentials are made.

The SIAT No. 1. The SIAT No. 1 is another paper-and-pencil test. It asks the student to analyze the function that various statements perform in a written argumentative dialogue. The split-half reliability coefficient, corrected with the Spearman-Brown formula,was .81. With this test (Table 11), the socratic discussion produced more positive results with students low and medium on the Guilford-Zimmerman Factor E (Emotional Maturity), while the recitation discussion was more effective with students high on this factor. The opposite result would seem plausible. That is, given the adversarial nature of the socratic discussion, students characterized by "evenness of moods, optimism, and composure" should handle the argumentative dialogue better and learn more. Perhaps, however, this factor score reflects the individual's tendency to react freely to stimulating situations--a characteristic that gives the impression of instability and immaturity. A person with a high emotional stability self-image would then, be expected to react favorably to the calmness of the recitation discussions, while his counterpart would react positively to, and learn more from, the affect-laden and exciting socratic.

The SIAT No. 3. The SIAT No. 3 is another interview measure. It is, however, a structured interview in which the student is asked to identify main points of disagreement between people in a written dialogue and to suggest strategies for settling the disagreements. The interview was recorded and scored on the basis of the number of arguments identified and acceptable strategies suggested, with the score decreasing as the number of cues given by the interviewer increased. Scorers were easily trained to obtain 85% agreement in scoring SIAT No. 3 transcripts.

The significant interaction with SIAT No. 3 involved the Word Description (tendency to dichotomize) Test (see Table 12). Students high and low on the Word Description Test performed better on the structured interview (SIAT No. 3) when taught by the socratic method, while students in the middle of the Word Description Test distribution were effected more positively by the recitation discussions. It will be recalled that students low on this measure also performed better in the socratic interview (SIAT No. 4) when taught by the socratic method (Table 3). People who do not tend to dichotomize are perhaps more comfortable in socratic discussions, and thus are able to learn concepts to be applied in the structured interview. However, the SIAT No. 3 does require an explicit analytic structure, which apparently the socratic discussion forces the high dichotomizer to impose on the situation, and which he can then apply during the less threatening interview.

The Unit Test. The final interaction is indicated by scores on the Unit Test--a compliation of scores from "teacher-made" tests administered during the school year for classroom grading purposes. Like typical classroom tests, the Unit

Tests (so named because they were administered at the ends of substantive instructional units) were made up of multiple-choice, true-false, essay, and short answer items. The intent was to get at the student's ability to apply the analytic concepts to substantive units. The interaction between the Guilford- Zimmerman Friendliness Factor and teaching style in affecting performance on the Unit Test (Table 13 ) is the opposite of that obtained for the SIAT No. 4 (Table 4). There is a marked increase in performance for recitation students from low to high on the friendliness factor; the socratic is much more effective than the recitation with students low on the factor, but less effective for students medium and high on the factor. Less friendly students--that is, those with lower toleration for hostile action and less of a tendency to be hostile or dominating themselves--may have concentrated their efforts on the more specific and manageable aspects of the units to compensate for the frustration or threat engendered by the socratic discussion's adversarial dislogue.

Conclusions

It is evident that our findings do not indicate stability of interaction patterns in the sense that certain personality variables consistently interacted with the two discussion styles investigated. In no case was any one personality variable involved in more than two significant interactions. It would be expected that different personality variables would show interaction effects with style for different measures of learning. This may account for some of the apparent lack of consistency in the findings. However, the converse did not hold. For example, despite rather high correlations among the SIAT Nos. 1 and 2 and the Unit Test (see Table 16), common interactions were not found. This may mean that although these three measures had from

31% to 58% of their variance in common, the common variance was a stable factor, such as reading ability or general intelligence, unaffected by instruction, and the interactions between teaching style and student personality were reflected in the other 69% to 42% of the variability in responses to the measures.

Despite the lack of consistent personality trait-method interactions, one finding is of particular interest. Tests which were more indirect and, perhaps for that reason, more valid measures of the effects of the instructional program were involved in interactions most frequently. The SIAT No. 4, involved in four significant interactions, required the student to use analytic concepts in the stress of a controversial dialogue; the Headlines G Test, involved in three significant interactions, asked the students to indicate which headlines indicated topics they would prefer reading about. Responses on neither test were taught directly in class, nor do these tests call for straightforward recall or application in a structured context. This very indirectness is an indication of validity, given the project's citizenship education goals. The concern was more with affecting the behavior of the students in unstructured, classroom situations than with affecting behavior on typical measures of learning.

Nevertheless, the variety of interactions is difficult to interpret. Undoubtedly, some chance findings are included in the tables. A series of studies involving careful replications is needed. At Utah State University, we are now involved in an extension of the earlier study* using high

---

*The project, entitled "A Secondary School Social Studies Curriculum Focused on Thinking Reflectively about Public Issues" is being carried out with support from the United States Department of Health, Education, and Welfare, Office of Education.

school juniors as subjects and including one more discussion style--a "seminar" style in which the teacher does not lead the discussion, but serves largely in a consultant role. Unfortunately, as is too often the case in educational research, we are not replicating the previous study--for many reasons all too familiar to other researchers.

The findings reported in this paper, with the rather dramatic instances of teaching method-student personality interactions--have powerful implications for instruction. It is clear that all students do not react similarly to the same teacher behavior. In addition, there is a strong suggestion that the appropriateness of the teacher's behavior depends not only on the student's personality traits, but on the learning outcome to be measured. Rather sophisticated methods of grouping for instruction, going far beyond the simple criterion of homogeneity on tests of general intelligence, may be called for. (In fact, the ineffectiveness of grouping based on mental ability (Borg, 1966) may be due to the confounding factor of personality differences within ability groups.) We are, however, far from the verified knowledge upon which teachers could base such grouping decisions, and the relationships between teaching methods, student personality traits, and learning outcomes may be so complex that researchers will never unravel them adequately to serve as a basis for instructional decisions. This pessimistic view runs counter to the general optimism of science. Despite the inherent difficulties, research into the interactions between teaching methods and student personality demands greater attention--especially given the lack of fruitfulness of research involving simple comparisons of methods.

## References

Borg, Walter R. Ability grouping in the public schools. Madison, Wisconsin: Dembar, 1966.

McKeachie, W. J. Motivation, teaching methods, and college learning. In Marshall Jones (Ed.), Nebraska symposium on motivation. Lincoln: University of Nebraska Press, 1961. Pp. 111-142.

McKeachie, W. J. Problems and perils in controlled research in teaching. In Erwin T. Steinberg (Ed.), Needed research in the teaching of English. Cooperative Research Monograph No. 11. Washington, D. C.: U.S. Department of Health, Education, and Welfare, 1962. Pp. 63-71.

Oliver, Donald W. and Shaver, James P. The analysis of public controversy: A study in citizenship education. Cambridge, Massachusetts: Harvard Graduate School of Education, 1962.

Oliver, Donald W. and Shaver, James P. Teaching public issues in the high school. Boston: Houghton Mifflin, 1966.

Shaver, James P. The ability of teachers to conform to two styles of teaching. Journal of Experimental Education. 1964, 32, (3), 259-267.

Wispe, Lauren G. Teaching methods research. American Psychologist, 1953, 8, 147-150.

TABLE 1: Summary of Personality and Learning Outcomes Measures Involved in Significant Interactions Between Teaching Style and Student Personality

| Personality Measures | Learning Outcomes Measures | | | | | |
|---|---|---|---|---|---|---|
| | Head-lines G | SIAT No. 4 | SIAT No. 3 | SIAT No. 2 | SIAT No. 1 | Unit Test |
| Guilford-Zimmerman | | | | | | |
| Factor A | X | | | | | |
| Factor E | | | | | X | |
| Factor F | | X | | | | X |
| Factor O | | | | X | | |
| Need-Cognition | X | | | X | | |
| Need-Structure | | X | | | | |
| Word Description | | X | X | | | |
| Submissiveness | X | | | | | |
| F-Scale | | X | | | | |

TABLE 2: Interaction Effect--Teaching Style and F-Scale (Authoritarianism) on the SIAT No. 4, Interview Posttest Means (Adjusted for Pretest and I.Q.)

| | F-Scale | | | |
|---|---|---|---|---|
| | Low | Med. | High | Style Mean |
| Socratic | 25.6 | 20.2 | 14.8 | 20.2 |
| Recitation | 17.3 | 24.8 | 18.4 | 20.1 |
| | 21.3 | 22.6 | 16.7 | |

Style x Personality: d.f. = 2/79; F = 3.35; P <.05 >.01
Main Effects
Style: NS
Personality: NS

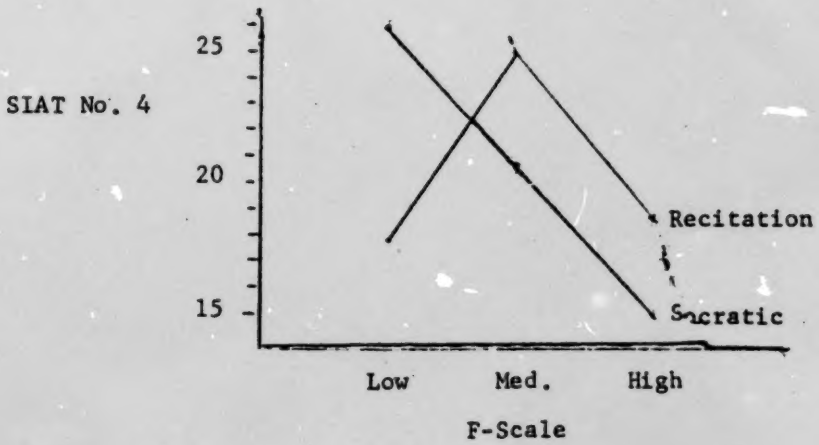
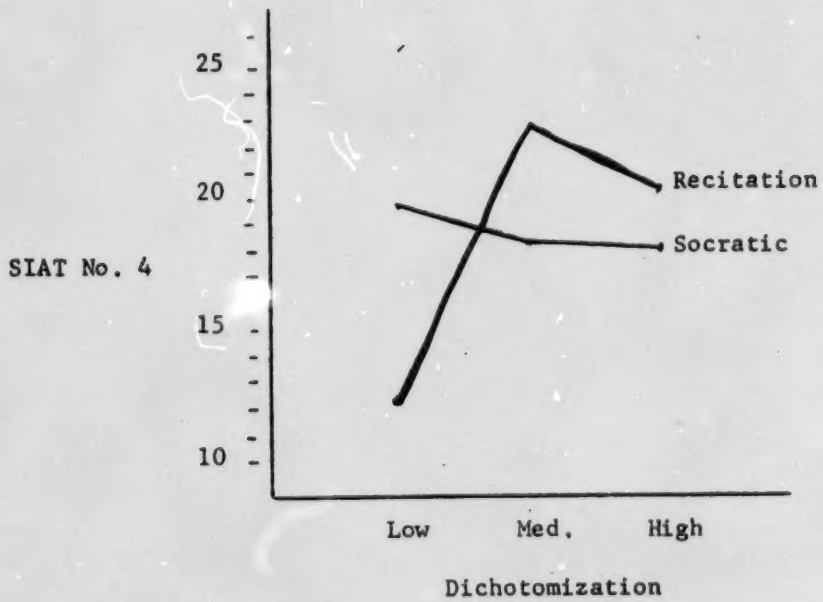


TABLE 3: Interaction Effects--Teaching Style and Word Description Test (Dichotomization) on the SIAT No. 4, Interview Posttest Means (Adjusted for Pretest and I.Q.)

| | Dichomotization | | | |
|---|---|---|---|---|
| | Low | Med. | High | Style Mean |
| Socratic | 19.7 | 18.4 | 18.3 | 18.8 |
| Recitation | 12.5 | 22.8 | 20.4 | 18.5 |
| | 16.0 | 20.7 | 19.4 | |

Style x Personality: d.f. = 2/79; F = 3.22; P<.05>.01
Main Effects
Style: NS
Personality: NS

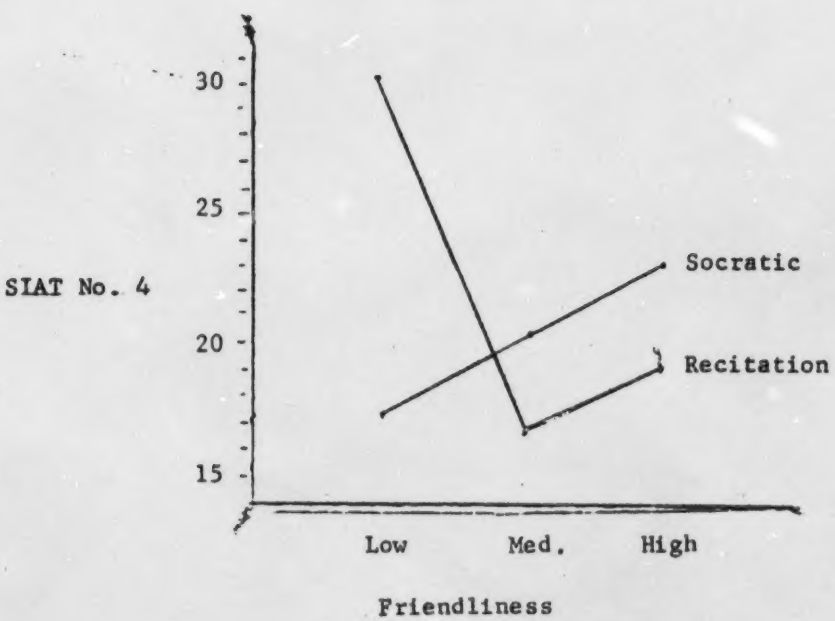


BEST COPY AVAILABLE

TABLE 4: Interaction Effects--Teaching Style and Guilford-Zimmerman Factor F (Friendliness) on the SIAT No. 4, Interview Post-test Means (Adjusted for Pretest and I.Q.)

| | Friendliness | | | |
|---|---|---|---|---|
| | Low | Med. | High | Style Mean |
| Socratic | 17.2 | 20.1 | 22.7 | 20.0 |
| Recitation | 29.9 | 16.5 | 17.7 | 21.3 |
| | 24.6 | 18.0 | 19.8 | |

Style x Personality: d.f. = 2/49; F = 4.75; P <.05 >.01
Main Effects
Style: NS
Personality: NS



BEST COPY AVAILABLE

TABLE 5: Interaction Effects--Teaching Style and School Work Habits (Need-Structure) on the SIAT No. 4, Interview Posttest Means (Adjusted for Pretest and I.Q.)

| | Need-Structure | | | |
|---|---|---|---|---|
| | Low | Med. | High | Style Mean |
| Socratic | 22.7 | 17.3 | 19.7 | 19.9 |
| Recitation | 15.9 | 23.7 | 1[illegible].8 | 18.8 |
| | 19.3 | 20.5 | 18.3 | |

Style x Personality: d.f. = 2/88; F = 3.7; P >.05 >.01
Main Effects
Style: NS
Personality: NS

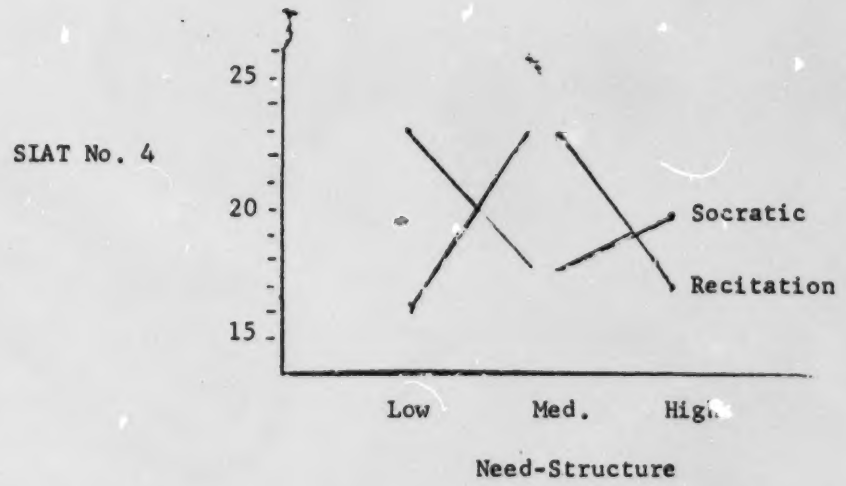


TABLE 6: Interaction Effects--Teaching Style and Need-Cognition on the Headlines G Posttest Means (Adjusted for Pretest and I.Q.)

| | Need-Cognition | | | |
|---|---|---|---|---|
| | Low | Med. | High | Style Mean |
| Socratic | 23.6 | 24.2 | 26.4 | 24.7 |
| Recitation | 23.7 | 25.3 | 26.2 | 25.1 |
| | 23.7 | 24.7 | 26.3 | |

Style x personality: d.f. = 2/89; F = 4.8; P $<$.05 $>$.01
Main Effects
Style: 6.45; P $<$.01
Personality: 6.73; P $<$.01

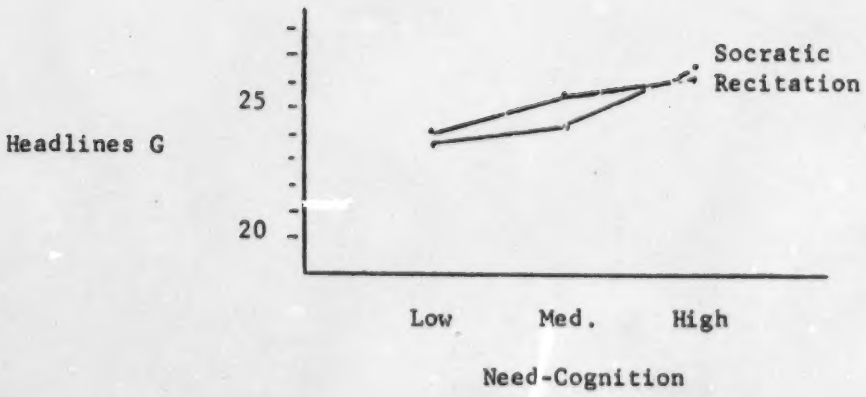


TABLE 7: Interaction Effects--Teaching Style and Guilford-Zimmerman Factor A (Ascendance) on the Headlines G Posttest Means (Adjusted for Pretest and I.Q.)

| | Ascendance | | | |
|---|---|---|---|---|
| | Low | Med. | High | Style Mean |
| Socratic | 25.4 | 26.2 | 25.9 | 25.8 |
| Recitation | 27.2 | 25.7 | 26.5 | 26.5 |
| | 26.3 | 26.0 | 26.2 | |

Style x Personality: d.f. = 2/85; F = 3.79; P $<.05 >.01$
Main Effects
Style: F = 5.12; $P<.01$
Personality: NS

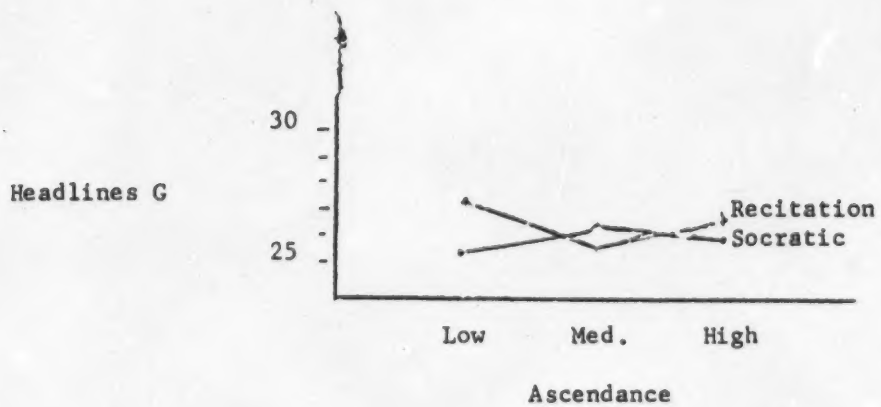


TABLE 8: Interaction Effects--Teaching Style and Submissiveness on the Headlines G Posttest Means (Adjusted for Pretest and I.Q.)

| | Submissiveness | | | |
|---|---|---|---|---|
| | Low | Med. | High | Style Mean |
| Socratic | 25.0 | 28.2 | 26.3 | 26.5 |
| Recitation | 27.5 | 26.1 | 27.6 | 27.1 |
| | 26.1 | 27.2 | 26.9 | |

Style x Personality: d.f. - 2/88; F = 3.56; P<.05>.01
Main Effects
Style: NS
Personality: NS

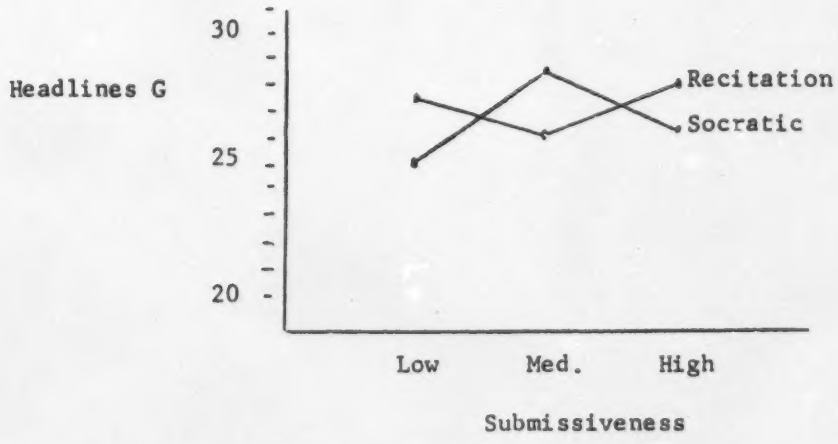


TABLE 9: Interaction Effects--Teaching Style and Need-Cognition on the SIAT No. 2 Posttest Means (Adjusted for Pretest and I.Q.)

| | Need-Cognition | | | |
|---|---|---|---|---|
| | Low | Med. | High | Style Mean |
| Socratic | 41.7 | 46.3 | 52.6 | 46.9 |
| Recitation | 46.0 | 48.1 | 48.7 | 47.6 |
| | 43.8 | 47.2 | 50.6 | |

Style x Personality: d.f. = 2/88; F = 4.81; P<.05>.01
Main Effects
Style: NS
Personality: F = 11.5; P<.01

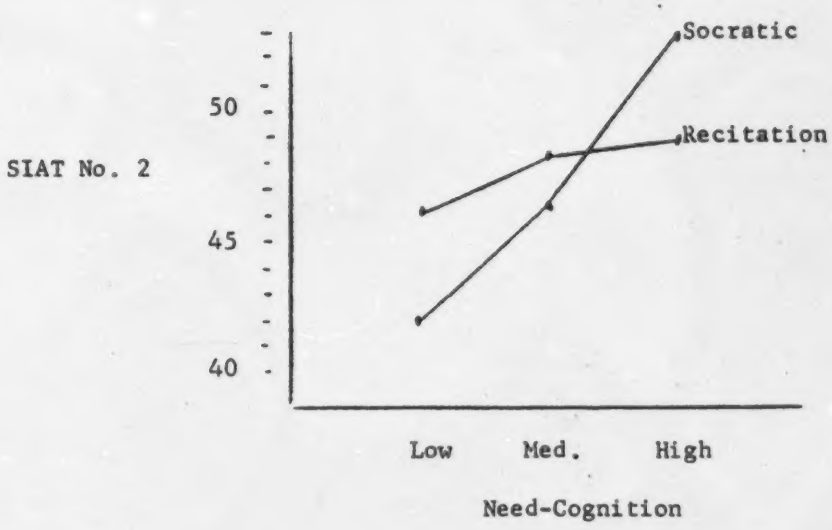


TABLE 10: Interaction Effects--Teaching Style and Guilford-Zimmerman Factor O (Objectivity) on the SIAT No. 2 Posttest Means (Adjusted for Pretest and I.Q.)

| | Objectivity | | | |
|---|---|---|---|---|
| | Low | Med. | High | Style Mean |
| Socratic | 45.0 | 48.3 | 42.2 | 45.2 |
| Recitation | 46.5 | 46.9 | 50.2 | 47.9 |
| | 45.7 | 47.7 | 45.9 | |

Style x Personality: d.f. = 2/70; F = 3.7; $P < .05 > .01$
Main Effects
Style: F = 3.6; $P < .05 > .01$
Personality: NS

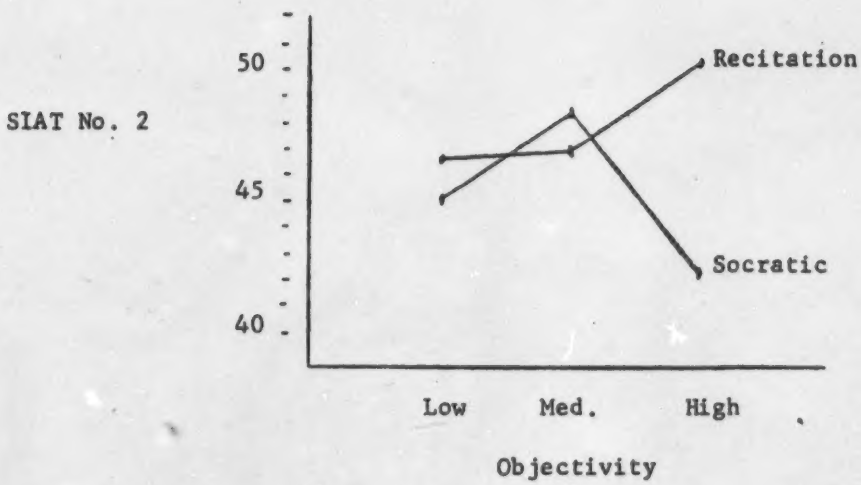


TABLE 11: Interaction Effects--Teaching Style and Guilford-Zimmerman Factor E (Emotional Maturity) on the SIAT No. 1 Posttest Means (Adjusted for Pretest and I.Q.)

| | Emotional Maturity | | | |
|---|---|---|---|---|
| | Low | Med. | High | Style Mean |
| Socratic | 12.3 | 14.3 | 11.7 | 12.8 |
| Recitation | 11.4 | 11.6 | 13.3 | 12.1 |
| | 11.8 | 13.0 | 12.5 | |

Style x Personality: d.f. = 2/83; F = 3.1; P<.05>.01
Main Effects
Style: NS
Personality: NS

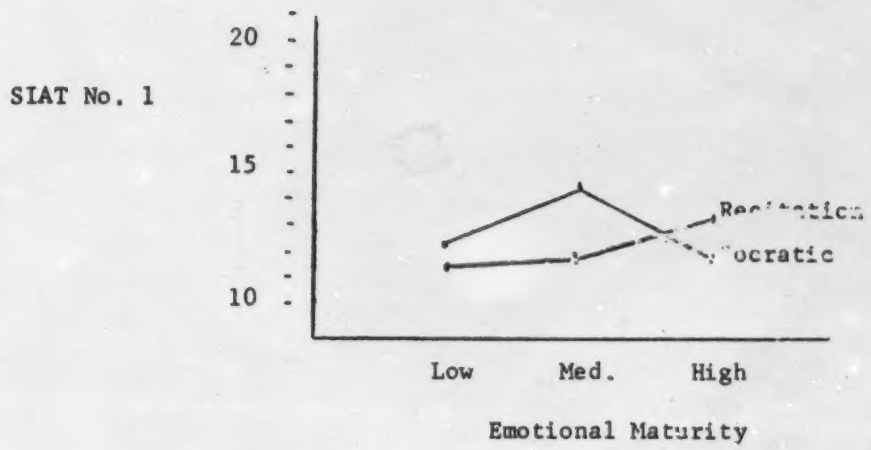


TABLE 12: Interaction Effects--Teaching Style and Word Description Test (Dichotomization) on the SIAT No. 3, Interview Posttest Means (Adjusted for Pretest and I.Q.)

| | Dichotomization | | | |
|---|---|---|---|---|
| | Low | Med. | High | Style Mean |
| Socratic | 32.1 | 28.1 | 32.3 | 30.8 |
| Recitation | 27.6 | 33.1 | 27.1 | 29.3 |
| | 29.8 | 30.7 | 29.6 | |

Style x Personality: d.f. = 2/84; F = 3.16; P < .05 > .01
Main Effects
Style: NS
Personality: NS

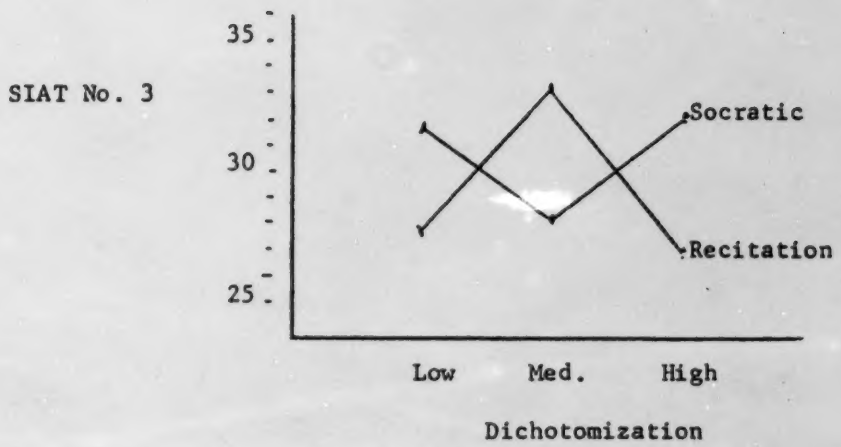


TABLE 13: Interaction Effects--Teaching Style and Guilford-Zimmerman Factor F (Friendliness) on the Unit Test Posttest Means (Adjusted for Pretest and I.Q.)

| | Friendliness | | | |
|---|---|---|---|---|
| | Low | Med. | High | Style Mean |
| Socratic | 171.3 | 146.5 | 157.2 | 158.3 |
| Recitation | 143.6 | 165.8 | 171.5 | 160.3 |
| | 155.5 | 157.6 | 165.4 | |

Style x Personality: d.f. = 2/56; F = 4.02; $P < .05 > .01$
Main Effects
Style: NS
Personality: NS

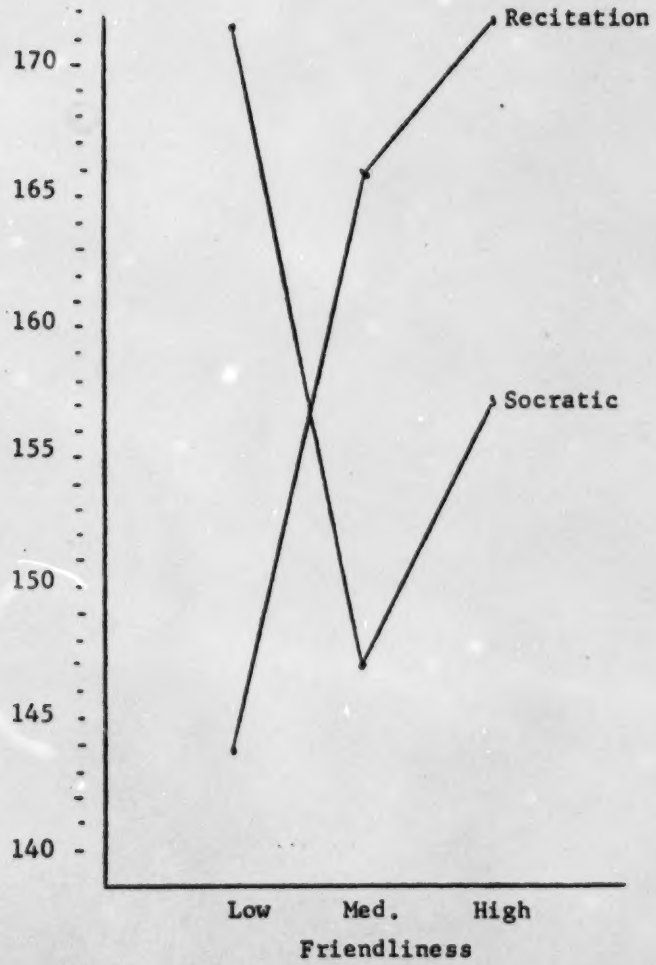


TABLE 14: Reliability Estimates for the Personality Measures Involved in Significant Interactions

| Measure | Coefficient* |
|---|---|
| Guilford-Zimmerman | |
| Factor A | .81 |
| Factor E | .81 |
| Factor F | .83 |
| Factor O | .83 |
| Need-Cognition | .67 |
| Need-Structure | .82 |
| Word Description | .82 |
| Submissiveness | .84 |
| F-Scale | .63 |

*Split-half coefficients corrected with Spearman-Brown Prophecy Formula.

TABLE 15: Correlations Among Personality Measures Involved in Significant Interactions

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| Guilford-Zimmerman | | | | | | | | | |
| (1) Factor A | | | | | | | | | |
| (2) Factor E | .31 | | | | | | | | |
| (3) Factor F | -.24 | .19 | | | | | | | |
| (4) Factor O | .19 | .62 | .54 | | | | | | |
| (5) Need-Cognition | .39 | .19 | .18 | .18 | | | | | |
| (6) Need-Structure | .24 | .16 | .08 | .10 | .52 | | | | |
| (7) Word Description | .27 | -.05 | -.30 | -.17 | -.03 | .28 | | | |
| (8) Submissiveness | -.16 | -.10 | .03 | -.18 | .02 | .20 | .03 | | |
| (9) F-Scale | -.06 | -.19 | -.25 | -.30 | -.02 | .12 | .18 | .54 | |

TABLE 16: Correlations Among Measures of Learning Involved in Significant Interactions

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| (1) Headlines G | | | | | | |
| (2) SIAT No. 4 | .07 | | | | | |
| (3) SIAT No. 3 | .14 | .39 | | | | |
| (4) SIAT No. 2 | .18 | .14 | .52 | | | |
| (5) SIAT No. 1 | .17 | .18 | .60 | .76 | | |
| (6) Unit Test | .09 | .14 | .56 | .68 | .73 | |

APPENDIX: Descriptions of Personality Measures Involved in Significant Interactions

Guilford-Zimmerman Temperment Survey

1. A - Ascendance: a high score is supposed to suggest leadership habits, speaking with individuals, non-submissiveness,

2. E - Emotional Stability: a high score is supposed to suggest evenness of moods, optimism, good composure.

3. F - Friendliness: a high score is supposed to suggest a toleration for hostile action and a tendency not to be belligerent, hostile, or dominating.

4. O - Objectivity: a high score is supposed to suggest that the respondent is thick-skinned, that he is not hypersensitive, self-centered, or over-suspicious.

5. Self-Reporting Need-Cognition Questionnaire: A high score is supposed to indicate a predisposition toward cognitive activity.
   Sample Item:
   If some music comes on the radio that you like, but don't recognize exactly, are you likely to: (a) just sit back and enjoy it, or (b) try and figure our what it is, who might have written it, or who is performing?

6. School Work-Habits Questionnaire (Need-Structure): A high score is supposed to indicate a desire for structure and order in dealing with school and related tasks.
   Sample Item:
   I write down my homework assignments in all my subjects.

7. Word Description (Dichotomization) Test: This measure is patterned after Osgood's semantic differential format, and the variable was obtained by counting the number of times the student chose to describe objects in extreme terms (Choice of "1" and "6" responses).
   Example:

| | Rope | |
|---|---|---|
| weak | 1 2 3 4 5 6 | strong |
| angular | 1 2 3 4 5 6 | rounded |
| rough | 1 2 3 4 5 6 | smooth |

8. Submissiveness Test: A high score is supposed to indicate a tendency to conform to external authority
   Sample Item:
   Children shouldn't have friends that their parents object to.

9. F-Scale: A measure of the tendency toward authoritarian solutions to basic social problems and interpersonal relations. (Adorno, et. al., The Authoritarian Personality. New York: Harper, 1950.)
   Sample Item:
   It is only right for a person to feel that his country or religion is better than any other.